REMARKS

The Office Action mailed July 21, 2006 has been carefully reviewed along with the reference cited therein. In the subject Office Action, the Examiner objected to claims 1-16 and 28-30 under § 103(a) as being unpatentable over U.S. Patent No. 5,278,432 (Ignatius et al.) in view of U.S. Patent No. 5,008,582 (Tanuma et al.). The Examiner indicated that claims 17-25, 26-27, 32 and 33 include allowable subject matter. Applicant appreciates the indication of allowable subject matter.

The Office Action

Claim Rejections – 35 USC § 103

Claims found to be unpatentable over Ignatius et al. in view of Tanuma et al.

When rejecting claims 1-16, 28-30, 36 and 37, the Examiner argued that it would have been obvious to one skilled in the art at the time of Applicants' invention to modify the LED lamp assembly of Ignatius et al. with the cooling fan disclosed in Tanuma et al. to ensure conditions, e.g. cooled surface, for the efficient illumination of the LED, whereby the piezoelectric fan produces a sufficient airflow without the noise commonly associated with motor fans. The Examiner's proposed combination, and thus his *prima facie* case for obviousness, fails for a number of different reasons. First, the Examiner's proposed motivation to combine Ignatius et al. with Tanuma et al. is flawed. Second, the references teach away from their combination. Third, the Examiner's proposed combination would render Ignatius et al., the primary reference, inoperable for its intended purpose.

The Examiner's proposed motivation to combine Ignatius et al. with Tanuma et al. is flawed. The Examiner argues that the piezoelectric fan disclosed in Tanuma et al. produces a sufficient airflow without the noise commonly associated with motor fans. Applicants respectfully disagree.

The bimorph vibrator, i.e. the fan, in Tanuma et al. is very small. Col. 4, lines 19-21. As shown in the figures of Tanuma et al., the fan 19 is smaller than or nearly as small as the package body 11 for the semiconductor chip 14 that the fan attaches to. Accordingly, swapping the fan 40 in Ignatius et al. for the small fan in Tanuma et al. would not "produce sufficient airflow" as the Examiner suggests.

The references, Ignatius et al. and Tanuma et al., simply teach away from their combination for at least two reasons. First, Tanuma et al. state that known rotary fans, like

the type employed in Ignatius et al., are useful when the density of the heat is generally uniform across the structure that is to be cooled. Col. 1, lines 21-25. Second, Tanuma et al. is concerned with cooling a system where temperature variations exist (see col. 1, lines 26-43) and temperature variations most likely would not exist in Ignatius et al.

Ignatius et al. employ a plurality of LEDs 14 disposed on a metal coated substrate 12 that acts as a heat sink for heat generated by the LEDs. Col. 3, lines 37-40. The LEDs are preferably grouped in sets and the LEDs in each set are connected in series. Col. 3, lines 45-48. Since the LEDs are connected in series and are described as all being the same, (see col. 2, lines 3-10), the LEDs should generate roughly the same amount of heat. By the time the heat from the LEDs reaches the interior of the housing, it should be generally uniform across the housing. Ignatius et al. employ an internal fan 40 (most likely a known rotary fan similar to those used in CPUs) that pulls heat from the interior of the housing 28 and propels it into the environment.

As mentioned above, Tanuma et al. recognize that if the heat that is being generated is generally uniform across a plane, then "effective cooling will be accomplished using an air flow having a predetermined velocity." Therefore, considering the teaching of Tanuma et al., one would not replace the fan 40 of Ignatius et al., where the fan pulls heat from the interior of the housing 28 and propels it into the environment, with a piezoelectric fan since the fan already disclosed in Ignatius et al. already performs this function quite well and Tanuma et al. simply confirm this fact.

Tanuma et al., on the other hand, is directed to cooling electronic devices where "variation between electronic devices assembled on the same printed circuit board" exist. See col. 1, lines 26-43. As discussed above, the temperature variations are most likely not present in the Ignatius et al. device. Tanuma et al. recognized that larger airflow in conventional cooling devices can create problems, e.g. overcooling smaller components; therefore, an object of the Tanuma et al. invention was "to provide an improved electronic device having fans fixed directly therein for cooling only that [electronic] device." Col. 1, lines 66-68.

More specifically, Tanuma et al. teach cooling fans 19 attached directly to a package body 11. Tanuma et al. specifically recites that "the invention [i.e. the piezofan] is applied to electronic parts generating high temperature, [and] the heat of the all the electronic parts may be efficiently dissipated without the need for a large air flow or a big blower." Col. 4,

lines 13-18. According to the teachings of Tanuma et al., if one does not employ the invention described in Tanuma et al., "an operator has to supply a larger air flow than is necessary, and a larger blower system is required" Col. 1, lines 40-42. Therefore, Tanuma et al. teaches a heat dissipation system that may still need a regular fan, it merely eliminates the need for a larger blower system.

In view of the fact that Tanuma et al. simply teach attaching piezoelectric fans directly to electronic packages and Tanuma et al. may not eliminate a regular rotary fan from the system, Tanuma et al. teach away from replacing a rotary fan that pulls heat from the interior of the housing and propels it into the environment with a piezoelectric fan.

The Examiner's proposed combination would render Ignatius et al., the primary reference, inoperable for its intended purpose. If Tanuma et al. suggest anything regarding modifying Ignatius et al., it would be attaching a piezoelectric fan directly to each LED that is provided in Ignatius et al. This construction, however, would destroy the intended function of the Ignatius et al. invention, which is directed to an apparatus for providing radiant energy, i.e. light, to enhance and test plant growth. Col. 1, lines 6-7. The small fans of Tanuma et al. would have to be attached directly to the LED, since Tanuma et al. teaches in every embodiment that there is one or a plurality of fans attached to each electronic package. The fan of Tanuma et al. would also have to mount to the same side of the circuit board that the LED mounts to in order to receive power and to cool the LED directly. Mounting the fan of Tanuma et al. directly to the LED of Ignatius et al. and on the same side of the circuit board would block the light being generated by the Ignatius et al. device, thus destroying the intended function of the device.

In view of the above, Applicants respectfully assert that the Examiner has failed to properly combine Ignatius et al. in view of Tanuma et al. when making his rejection. Accordingly, the Examiner has failed to establish a *prima facie* case for obviousness. In view of that, Applicants respectfully request that the Examiner remove the rejection.

Claims found to be unpatentable over Belliveau in view of Glezer et al.

Claim 34 has been amended to recite "a heat sink disposed in said housing, said LED being mounted to said heat sink and in thermal communication with said heat sink." In view of this claim amendment, the Examiner cannot properly combine Belliveau and Glezer et al.

The invention in Belliveau is directed to providing "an inexpensive method of converging and diverging a plurality of light sources by mounting the light sources to a flexible substrate that may be deformed to change the angular relationship of the plurality of light sources." Col. 2, lines 20-24. Not to be bound to only the embodiments disclosed in Applicants' disclosure, mounting the LEDs 912 in Belliveau to a heat sink similar to that disclosed in FIGURE 1 (heat dissipating structure 16) or FIGURE 18 (heat sink 214) of Applicants' disclosure would greatly reduce the flexibility of the flexible substrate in Belliveau. The intended function of the invention in Belliveau would be destroyed if one were to mount the LEDs found on the flexible substrate of Belliveau to a heat sink. Accordingly, claim 34, and those claims that depend from claim 34, define over the cited references.

New Claims

Claims 38 – 42 have been added to the application. These define over the cited references for the reasons discussed below.

Claim 38 depends from claim 36, which the Examiner has rejected as unpatentable over Ignatius et al. in view of Tanuma et al. Claim 38 further defines over the cited references because it recites "further comprising a plurality of LEDs mounted to said support, each of said LEDs conducting heat through said support and into said heat sink." As discussed above, each example shown and described in Tanuma et al. depicts a single fan or a few fans that cool a single electrical component. Tanuma et al. reinforces this fact when stating that an "object of the invention is to provide an improved electronic device having fans fixed directly therein for cooling only that [electronic] device." Col. 1, lines 66-68. After considering the teachings of Tanuma et al. as a whole, one skilled in the art would not combine Tanuma et al. with Ignatius et al. to cool a plurality of LEDs. Accordingly, claim 38 further defines over the Examiner's proposed combination.

Claim 39 recites "an LED" and "a fluid current generator disposed with respect to said LED for creating a fluid current to cool said LED, wherein said fluid current generator includes a piezoelectric material, a first flexible side plate and a second flexible side plate, the first flexible side plate and the second flexible side plate connected by a flexible hinge." The Examiner indicated that the prior art fails to teach or suggest such a fluid current generator.

Claim 42 recites "a synthetic jet actuator disposed in said housing for generating a current of fluid to cool said LED, the synthetic jet comprising a body having an fluid cavity and at least two movable elements for increasing and reducing the volume of the fluid cavity to generate the current of fluid." Glezer et al. fail to disclose such a synthetic jet actuator.

Accordingly, Applicant's submit that the new claims presented in this application define over the cited references.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1-42) are now in condition for allowance.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, LLP

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Date

Scott A. McCollister, Reg. No. 33,961
Jonathan A. Withrow, Reg. No. 54,548
1100 Superior Avenue, Seventh Floor
Cleveland, OH 44114-2579
216-861-5582

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